45. (new) The method of claim 44 wherein said position signal is generated by a magneto-strictive sensor adjacent said valve member.

46. (new) The electromechanical valve assembly of claim 1 further comprising a magnet disposed on said rotor and a magneto-strictive sensor adjacent said rotor, said sensor generating a position signal responsive to a rotational position of said magnet.

REMARKS

I. INTRODUCTION

Applicant thanks the Examiner for carefully considering the subject application. Applicant has amended claims 1, 14, 37, 41 and cancelled claim 43. Applicant has added new claims 45, 46. Claims 1-8, 11-14, 24-26, 35-42, 44-46 are presently pending in the application. Applicant believes that all of the pending claims are allowable and respectfully requests further examination of the claims in view of the following arguments.

II. REJECTION OF CLAIMS 14, 41 UNDER 35 U.S.C. 102(b)

A. Introduction

Claims 14, 41 stand rejected under 35 U.S.C. 102(b) based on Hirt (U.S. Patent 4,256,065). Applicant respectfully submits that the rejection of claims 14, 41, as amended, is improper because Hirt fails to teach all of the limitations of the claims.

Referring to independent claim 41, Applicant has amended claim 41 to include all of the limitations of dependent claim 43.

Because the Examiner indicated dependent claim 43 would be allowable if rewritten in independent form, Applicant submits that claim 41, as amended, is allowable.

Referring to independent claim 14, the claim, as amended, recites:

14. An electromechanical valve assembly for an internal combustion engine, comprising:

a rotary electric actuator configured to rotate a ballnut; and,

a valve having a valve stem and a valve head, said valve stem operatively connected to said ballnut, said valve stem configured to move generally axially responsive to the rotation of said ballnut to selectively engage and disengage said valve head with a valve seat of an engine cylinder.

Referring to Hirt, a valve operating system is disclosed. The valve operating system includes a drive shaft 25 that rotates a spindle 15. See Hirt, column 3, lines 24, 35. When a solenoid 18 is actuated, rotation of a sleeve 16 is restricted which induces sleeve 16 and valve stem 11 to move axially downwardly. See Hirt, column 2, lines 59-65. In other words, the sleeve 16 does not rotate as the valve stem 11 moves downwardly. Thus, Hirt clearly fails to teach the limitation of "said valve stem configured to move generally axially responsive to the rotation of said ballnut to selectively engage and disengage said valve head with a valve seat of an engine cylinder, as recited in claim 14.

Hirt also fails to teach a rotary electric actuator that rotates a ballnut, as recited in claim 14. In contrast, the only electrical device disclosed in Hirt is the solenoid 18 which does not rotate any component.

Because the Hirt fails to teach all of the limitations of independent claim 14, Applicant submits the rejection of claim 14 under 35 U.S.C. 102(b) is improper. Accordingly, Applicant respectfully requests the rejection of claim 14 be withdrawn.

III. REJECTION OF CLAIM 44 UNDER 35 U.S.C. 102(b)

Claim 44 stands rejected under 35 U.S.C. 102(b) based on Kamimaru (U.S. Patent 4,256,065). Applicant respectfully submits that the rejection of claim 44 is improper because Kamimaru fails to teach all of the limitations of claim 44.

44. A method for controlling an electromechanical valve in an internal combustion engine, comprising:

controlling movement of a valve member based on an electrical control signal;

generating a position signal indicative of a position of said valve member; and,

commanding said valve member to stop when said position signal indicates said valve member is proximate a valve seat of an engine cylinder.

Referring to Kamimaru, an electromagnetically operated valve driving system is disclosed. In particular, the system utilizes data such as an engine speed, an accelerator opening angle, a crank angle, a coolant temperature to calculate an opening and closing time of a valve. See Kamimaru, column 3, lines 22-34. None of the above-recited data is a position signal indicative of a position of the valve member, as recited in claim 44. Further,

Applicant after carefully reviewing Kamimaru have been unable to find any teaching of a position sensor which would generate a position signal indicative of the position of the valve member. Further, Applicant has been unable to find any teaching of commanding a valve member to stop when the position signal indicates the valve member is proximate a valve seat of an engine cylinder, as recited in claim 44.

Because Kamimaru fails to teach all of the limitations of independent claim 44, Applicant submits the rejection of claim 44 under 35 U.S.C. 102(b) is improper. Accordingly, Applicant respectfully requests the rejection of claim 44 be withdrawn.

IV. REJECTION OF CLAIMS 1, 37-40 UNDER 35 U.S.C. 103(A)

The Examiner has rejected claims 1, 37-40 under 35 U.S.C. 103(a) based on Gerling (U.S. Patent 5,931,142). Applicant respectfully submits that the rejection of independent claims 1, 37, as amended, and independent claim 38 is improper because the reference does not teach all of the limitations of claims 1, 37, 38.

Independent claim 1 recites:

1. An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head

against a valve seat of said engine cylinder to prevent gas flow into or out of said engine cylinder.

Referring to Gerling, a linear actuation device is disclosed. In particular, a linear actuation device that can be utilized as an exhaust gas recirculation valve is disclosed. See Gerling, column 5, lines 49-53. Gerling, however, provides no teaching of an electromechanical valve assembly that moves a valve head against a valve seat of an engine cylinder to prevent gas flow into or out of said engine cylinder, as recited in independent claims 1, 37, 38.

Still further, referring to Figure 4 of Gerling, the reference teaches use of conventional intake and exhaust valves 49, 50 communicating with an engine cylinder. See Gerling, column 9, lines 53, 54. As such, Gerling is actually teaching away from utilizing an electromechanical valve assembly to move a valve head against of valve seat of an engine cylinder. Because the combination fails to teach all of the limitations of independent claims 1, 37, 38 and dependent claims 39-40, and Gerling teaches away from the claimed invention, Applicant respectfully submits that the rejection of claims 1, 37-40 under 35 U.S.C. 103(a) is improper.

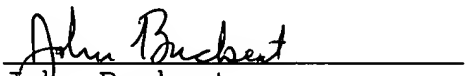
V. CONCLUSION

For the above-cited reasons, all the claims presently pending in this application are believed to be allowable. If the Examiner has any further questions or concerns regarding this matter, he is invited to call the Applicant's under signed attorney.

Please charge any cost incurred in the filing of this Amendment, along with any other costs, to Deposit Account

06-1510. If there are insufficient funds in this account, please charge the fees to Deposit Account No. 06-1505.

Respectfully submitted,



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MARKED-UP VERSION OF THE AMENDED CLAIMS

1. An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head against a valve seat [in] of said engine cylinder to prevent gas flow into or out of said engine cylinder[; and,

an anti-twist guide for preventing said valve stem from rotating about said first axis].

14. An electromechanical valve assembly for an internal combustion engine, comprising:

a rotary electric actuator configured to rotate a [having a rotatable] ballnut; and,

a valve having a valve stem and a valve head, said valve stem operatively connected to said ballnut, said valve stem configured to move generally axially responsive to the rotation of said ballnut to selectively engage and disengage said valve head with a valve seat of an engine cylinder [on a cylinder head of said engine].

37. An electromechanical valve assembly for an internal combustion engine, said engine having an engine cylinder, said assembly comprising:

a rotor centered about a first axis having a bore extending generally axially therethrough;

a stator operatively disposed about said rotor for producing a torque to cause rotation of said rotor about said first axis;

a valve having a valve stem and a valve head, said valve stem configured to move upwardly when said rotor rotates in a first direction to move said valve head against a valve seat of said engine cylinder [in said engine] to prevent gas flow into or out of said engine cylinder; and,

a position sensor for determining a rotational position of said rotor.

41. An electromechanical valve assembly for an internal combustion engine, comprising:

a valve member;

an electrically actuated ball-screw device operably coupled to said valve member, said device moving said member towards a valve seat of an engine cylinder; and

a position sensor generating a position signal indicative of an axial position of said valve member.